WHAT IS CLAIMED IS:

1. A receiving apparatus for receiving the signal modulated by a multi-carrier modulation scheme for transmitting the information code using a plurality of carriers, said signal containing data carriers and periodically inserted pilot carriers fixed in amplitude and phase, said apparatus comprising:

a correlating operation unit for calculating the cross-correlation between the received signals with data carriers distant to each other to such an extent as to eliminate the correlation substantially; and

an extraction unit for extracting the correlation component of the signal as related to said pilot carriers, based on the result of the cross-correlating operation by said correlating operation unit.

2. A receiving apparatus according to Claim 1,

wherein said correlating operation unit includes a first correlating operation unit for calculating the cross-correlation between said received signal and a signal obtained by delaying said received signal by a time length corresponding to selected one of a predetermined symbol period or an insertion period of said pilot carriers; and

wherein said extraction unit extracts the correlation component of the signal as related to said pilot carriers based on the result of the cross-correlating operation by said first correlating operation unit.

3. A receiving apparatus according to Claim 2,

wherein said correlating operation unit further includes a second correlating operation unit for calculating the cross-correlation between said received signal and a signal obtained by shifting said received signal relatively by a length equal to the valid symbol period; and

wherein said extraction unit includes a subtractor for subtracting the result of the correlating operation of said first correlating operation unit from the result of the correlating operation of said second correlating operation unit.

4. A receiving apparatus according to Claim 3, further comprising:

a control unit to control the sampling clock frequency for sampling the received signal of said receiving apparatus into synchronism with a predetermined clock frequency of the transmission apparatus, based on the result of subtraction by said subtractor.

5. A receiving apparatus according to Claim 4,

wherein said control unit includes:

an adder for extracting a signal in the extraction range corresponding to the guard interval period from the output of said subtractor, said extraction process being repeated each time said extraction range is shifted by one sample period over the entire signal section for said correlating operation thereby to add the values of the extracted signals;

a symbol timing detector for determining the difference between the symbol phase of said received signal and a predetermined reference phase based on the result of addition by said adder; and

a control unit for controlling the sampling clock frequency of said received signal in accordance with said detected difference.

6. A receiving apparatus according to Claim 4,

wherein said control unit generates a signal for controlling the position of the time window for FFT operation on the received signal in the receiving apparatus, based on the result of subtraction by said subtractor.

7. A receiving apparatus according to Claim 4, further comprising a delay profile unit for generating a delay profile of said received signal, based on the result of subtraction by said subtractor.

8. A receiving apparatus according to Claim 1,

wherein said correlating operation unit includes a first correlating operation unit for calculating the cross-correlation between said received signal and a signal obtained by delaying said received signal by a length equal to the guard interval period of the symbol, and

wherein said extraction unit extracts the correlation component of the signal as related to said pilot carriers, based on the result of the cross-correlating operation by said first correlating operation unit.

9. A receiving apparatus according to Claim 8,

wherein said correlating operation unit further includes a second correlating operation unit for calculating the cross-correlation between said received signal and a signal obtained by shifting said received signal relatively by a length equal to the symbol period, and

wherein said extraction unit includes a subtractor for subtracting the result of the correlating operation of said first correlating operation unit from the result of the correlating operation of said second correlating operation unit.

10. A receiving apparatus according to Claim 1,

wherein said correlating operation unit includes a first correlating operation unit for calculating the cross-correlation between said received signal and a signal obtained by delaying said received signal by a length equal to the guard interval period of the symbol, and

wherein said extraction unit extracts the correlation component of the signal as related to said pilot carriers, based on the result of the correlating operation by said first correlating operation unit.

11. A receiving apparatus according to Claim 10,

wherein said correlating operation unit

further includes a second correlating operation unit for calculating the cross-correlation between the output signal of said first correlating operation unit and a signal obtained by shifting the output signal of said first correlating operation unit relatively by a length equal to the valid symbol period; and

wherein said extraction unit includes a subtractor for subtracting the result of the correlating operation of said first correlating operation unit form the result of the correlating operation of said second correlating operation unit.

12. A method for receiving a signal modulated by a multi-carrier modulation scheme for transmitting the information code using a plurality of carriers, said signal containing data carriers and periodically inserted pilot carriers fixed in amplitude and phase, said method comprising:

a step of calculating the cross-correlation between the received signals with the data carriers distant to such an extent as to eliminate the correlation substantially; and

a step of extracting the correlation component of the signal as related to said pilot carriers, based on the result of the calculation of said cross-correlation.

13. A receiving method according to Claim 12,

wherein said correlating operation step includes the first correlating operation step for calculating the cross-correlation between said received signal and a signal obtained by delaying said received signal by a length equal to selected one of a predetermined symbol period or an insertion period of said pilot carriers, and

wherein said extraction step extracts the correlation component of the signal as related to said pilot carriers, based on the result of the correlating operation in said first correlating operation step.

14. A receiving method according to Claim 13,

wherein said correlating operation step further includes the second correlating operation step for calculating the cross-correlation between said received signal and a signal obtained by shifting said received signal relatively by a length equal to the valid symbol period, and

wherein said extraction step includes the step of subtracting the result of the correlating operation of said first correlating operation step from the result of the correlating operation of said second correlating operation step.

15. A receiving method according to Claim 14, further comprising:

a step of controlling the sampling clock frequency for sampling said received signal into synchronism with a predetermined clock frequency of the transmitter, based on the result of subtraction in said subtraction step.

16. A receiving method according to Claim 15, wherein said control step includes:

an addition step of extracting the signal in the extraction range corresponding to the guard interval period from the result of said subtraction step and repeating the extraction each time said extraction range is shifted by one sample period over the signal section for said correlating operation, the values of said extracted signals being added to each other;

a step of determining the difference between the symbol phase of said received signal and a predetermined reference phase, based on the result of addition in said addition step; and

a control step of controlling the sampling clock frequency of said received signal in accordance with said detected difference.

17. A receiving method according to Claim 15, wherein said control step further includes the step of generating a signal for controlling the position of the temporal window for FFT operation of said received signal, based on the result of said subtraction.

18. A receiving method according to Claim 15, further comprising:

a step of generating a delay profile of said received signal based on said result of subtraction.

19. A receiving method according to Claim 12,

wherein said correlating operation step includes a first correlating operation step for calculating the cross-correlation between said received signal and a signal obtained by delaying said received signal by a length equal to the guard interval period, and

wherein said extraction step extracts the signal correlation component as related to said pilot carriers, based on the result of the cross-correlating operation in said first correlating operation step.

20. A receiving method according to Claim 19,

wherein said correlating operation step further includes a second correlating operation step for calculating the cross-correlation between said received signal and a signal obtained by shifting said received signal by a length equal to the symbol period, and

wherein said extraction step includes the step for subtracting the result of the correlating operation of said first correlating operation step from the result of the correlating operation in said second correlating operation step.

21. A receiving method according to Claim 12,

wherein said correlating operation step includes a first correlating operation step for calculating the cross-correlation between said received signal and a signal obtained by delaying said received signal by a length equal to the guard interval period, and

wherein said extraction step extracts the signal correlation component as related to said pilot carriers, based on the result of the cross-correlating operation in said first correlating operation step.

22. A receiving method according to Claim 21,

wherein said correlating operation step further includes a second correlating operation step for calculating the cross-correlation between the output signal of said first correlating operation step and a signal obtained by shifting the result of operation in said first correlating operation step relatively by a length equal to the valid symbol period; and

wherein said extraction step includes the step for subtracting the result of the correlating operation in said first correlating operation step from the result of the correlating operation in said second correlating operation step.